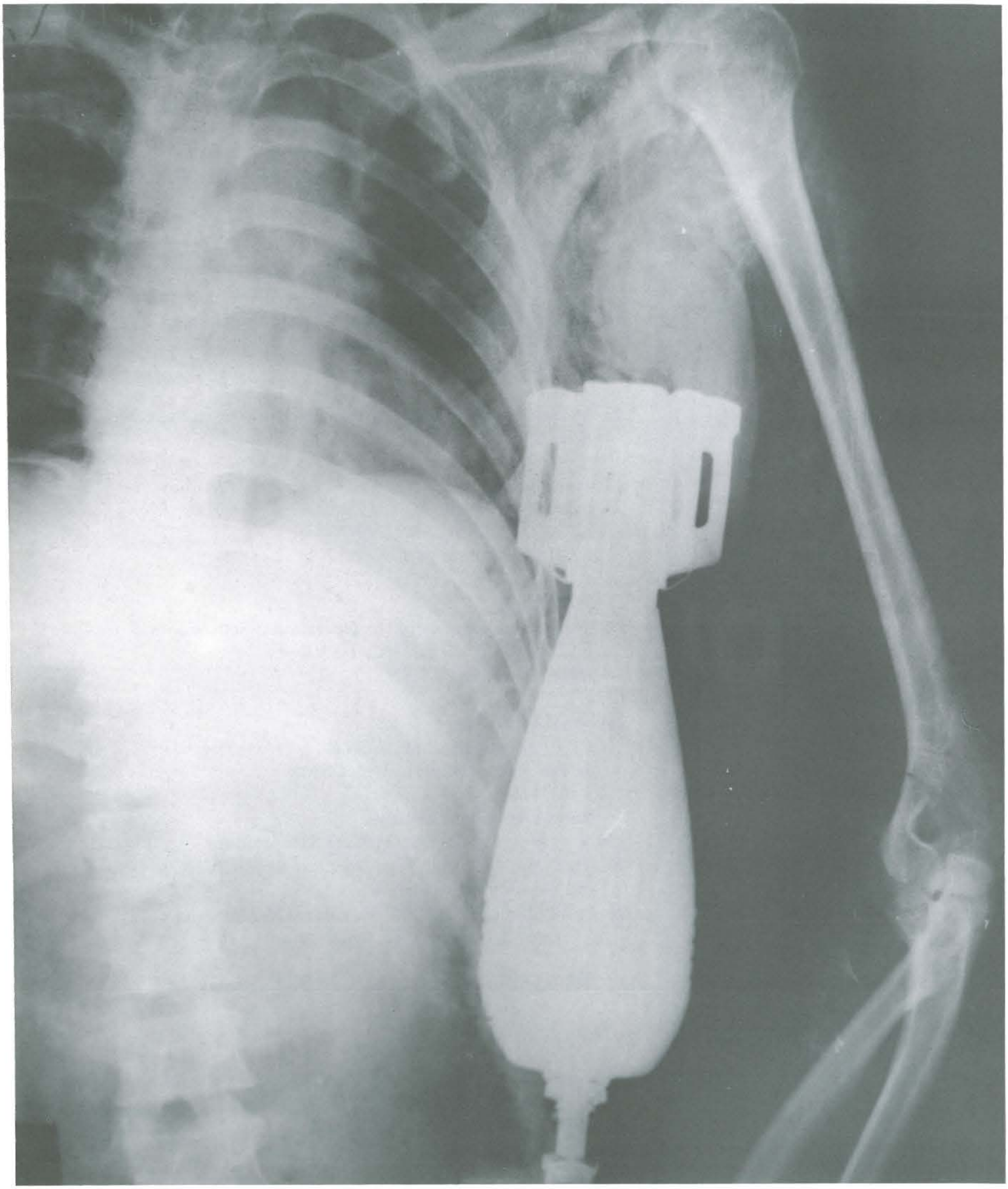
NAVY MEDICINE

November-December 1989



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COVER: In 1966, a Viet Cong mortar shell slammed into the chest of a South Vietnamese soldier. The removal of this live ordnance became the subject of one of the most dangerous and innovative combat surgeries ever performed. Story on page 6. Photo courtesy CAPT Harry H. Dinsmore, MC, USN (Ret.).

A look back: Navy medicine 1913

BUMED Archives

Naval Hospital, Puget Sound, WA

Department Rounds

Flight Surgeon's Heart and Hands Go Out to Villagers

Flight surgeon Dr. Richard Uruchurtu oversees the work of other medical personnel during Exercise King's Guard.

The line of Honduran people grew longer as they waited for free medical care at the Devalle Clinic, Soto Cano Air Base, Honduras. The lyrics of a popular American song playing on the radio seemed surreally appropriate for the occasion: "I came here, for you to love . . . ."

The heat of the day was thick and oppressive, yet the doctors, nurses, and medics worked at a furious pace. Treating each of the 200 sick or crippled indigents was a priority.

The medical staff, composed primarily of Army and Air Force personnel of the U.S. Joint Task Force-Bravo (JTF-B), U.S. Southern Command, provided free medical services three times a week. The clinic augmented the relatively simple Honduran medical practices. Because of a small U.S. staff, their treatment was limited to patients whose cases fell outside the realm of Honduran medical expertise. Often, those cases prove to be the most shocking.

"They've walked, crawled, or hitchhiked through the stifling heat to be here. Why can't we work through these conditions?" seemed to be the thought driving the military medical staff. And work through it, they did.

In one corner of an outdoor area at the clinic, a U.S. Navy physician spoke soothingly, in Spanish, to his elderly patient. He offered words of relief to the woman, whose festering ulcer had eaten a hole deep into her leg as he also gave instructions, in English, to the U.S. Army medic scrubbing her wound.

"Scrub away that dead yellow skin," instructed LT Richard Uruchurtu, MC, "give the proud flesh under it a chance to heal.

"I've had the experience, in the past, of being in Third World countries," said the 37-year-old Uruchurtu. "I've seen poverty and was somewhat familiar with impoverished conditions. I knew this would be very different than walking down the street in La Jolla (CA)," he continued. "But I suppose what caught me by surprise were the array and severity of the illnesses that plague this country. That, I hadn't seen."

Uruchurtu attributed much of the country's medical problems to a lack of education about basic preventive medicine. He said soberly, "To the man with a wife and several children, it's more important to vaccinate his cows than to vaccinate his children. He can always have more children," he went on, "but he can't always get another cow."

An elderly patient winces as Dr. Uruchurtu treats her ulcerated foot (below).

Uruchurtu also blamed poor hygiene for many of the country's woes. "The combination of poor education, lack of running water, poor nutrition, and poor personal hygiene

serves to create life-threatening situations out of basically simple conditions," he said.

"Life is cheap here," he continued. "I've seen pain and suffering, but I haven't seen those conditions go on as long as they have here." The doctor saw things he had previously only read about in medical textbooks.

Because of his affiliation with Marine Light Attack Helicopter Squadron 267, Uruchurtu spent 3 days a week with the JTF-B medical staff during the month he was in the country.

Uruchurtu worked well with the local Honduran people, perhaps because of his Basque/Spanish heritage, or maybe due to his humble beginnings. "I didn't come from a jaded background," he explained with an ever-ready smile. Having a father who worked for the Federal Aviation Administration meant that his family relocated several times during his childhood.

In 1973, at age 22, Uruchurtu joined the U.S. Air Force as a medic. From the beginning of his enlistment, he saved money and invested his spare time in a college education. "I didn't have the means to put myself through college.

"True to its word, the military had tuition assistance, educational programs, worldwide assignments, off-duty education courses, correspondence courses, and education offices. These were the tools I needed and used to carve out my future," Uruchurtu gratefully acknowledged. He spent 6 years in the Air Force, and by the end of his enlistment he had acquired his bachelor's degree.

After his discharge in 1979, he embarked on a trail toward fulfilling a childhood dream—becoming a physician. Uruchurtu was accepted to the College of Osteopathic Medicine of the Pacific (Los Angeles) before finishing his last year at graduate school at the University of New Mexico. A chance meeting with a Navy medical recruiting officer at a medical convention encouraged him to once again join the military.

After doing his internship at Oklahoma Osteopathic Hospital in Tulsa and flight training at Pensacola, he was designated a flight surgeon to work with the Marine Corps.

King's Guard '89, the training exercise linking U.S. Marine, U.S. Navy, and Honduran Marine and Army forces, brought him to Honduras. Helping the JTF-B medical staff get hundreds of destitutes back to reasonably good health was a large part of his mission. While, maintaining the good health of his marines was his primary purpose, the dire need of the natives, coupled with the severity of their conditions made their care slightly more pressing. "This is not typical Military Sick Call out here," he said, "it's not colds, sprained ankles, or athlete's foot. This is no kidding, real-world disease here.

"I'm a physician," he continued, "and for me to be able to help people who are truly in need gives me feelings I can't put into words." As he spoke, the cry of a small child having blood drawn grew louder. "That child is begging for her mother to burp her," he said, "that is the only way she has ever known to deal with pain."

Uruchurtu strongly emphasized that he and his American colleagues were not in Honduras to replace its medical corps. "We are here to augment their program and to train them in some modern basics. We are not here to belittle the good they're doing."

The basic difference between Honduran and American doctors is not really in quality of people, said Uruchurtu, but in the technology and training available to them. "The best we can hope for down here is to get these people's wounds to a point where the body's defense system can begin fighting illness again and the Honduran doctors can help maintain that system. The Honduran people can also be taught proper personal hygiene, and that's going on right now," said Uruchurtu.

While in Honduras, Uruchurtu had high hopes of changing the lives of the people with whom he came in contact. There is little doubt that he did, given his gift for medicine and love for people. One other benefit from his working with these people is apparent in Uruchurtu. The Honduran indigents have touched his life as well.

"This, for me, was a professionally and emotionally enriching experience," he beamed, "sometimes, when in garrison conditions, things get a little ordinary. Out here, it's anything but ordinary." □

—Story and photos by LCPL Steven E. Savage, USMC, Joint Public Affairs Office, MCAS, El Toro, CA 92709.

Dr. Uruchurtu fills out paperwork on a Honduran patient.

Photos by LCPL Steven E. Savage, USMC

New Facility Dedicated

The Navy Environmental Health Center's (NAVENVIRHLTHCEN) long struggle to establish a permanent home came to an end. On 17 July 1989, the Center formally dedicated a new facility in an office complex adjacent to the Norfolk, Virginia International Airport.

The building dedication ceremony was the culmination of an evolutionary process for NAVENVIRHLTHCEN which has spanned a quarter of a century. In 1964, the Navy's Bureau of Weapons identified the need for an occupational health program which would encompass all fleet readiness and training ordnance field activities.

The Bureau's idea for a comprehensive occupational health program began to take shape with the broadening of the occupational health function of the Naval Ammunition Depot, Crane, IN. In 1967, the Crane program was formalized with the establishment of the Naval Ordnance Systems Command Environmental Health Center. On 1 July 1970, the Environmental Health Center became a Headquarters Detachment of the Naval Ordnance Systems Command (NAVORD), Cincinnati, OH. In October 1970, it became the Naval Ordnance Environmental Health Center (NOEHC), NAVORD. In 1971, NOEHC—renamed the Navy Industrial Environmental Health Center—was brought under the aegis of the Bureau of Medicine and Surgery (BUMED). In July 1974, the Center became NAVENVIRHLTHCEN—an Echelon 3 shore activity under the command and support of BUMED. In response to an increase in requests for fleet support and an expansion of its occupational health mission, a move by the Center to Norfolk, VA, was initiated in 1978 and completed in 1979. Finally, in May 1989, after 10 years on the Norfolk Naval Station in three separate, temporary facilities, NAVENVIRHLTHCEN moved into ample, modern spaces specifically designed and built for the command.

Since its relocation from Cincinnati to Norfolk in 1979 to be closer to the fleet, NAVENVIRHLTHCEN's mission, staff, and needs have increased dramatically, making it necessary to find a more suitable base of operation.

The Center is currently charged with coordinating and providing centralized support and services to Navy medical activities ashore and afloat in the areas of occupational health, environmental health, and preventive medicine. It is also charged with coordinating and reviewing all occupational health and preventive medicine programs under the direction and management of BUMED. Finally, NAVENVIRHLTHCEN is responsible for six Echelon 4 commands: Navy Environmental and Preventive Medicine Units No. 2, Norfolk, VA; No. 5, San Diego, CA; No. 6, Pearl Harbor, HI; and No. 7, Naples, Italy; and Navy Disease Vector Ecology and Control Centers in Alameda, CA, and Jacksonville, FL.

When the Center leased and occupied 28,000 square feet of new command spaces in May 1989, it consolidated all its departments and staff (except its Echelon 4 commands) in one location—a move intended to foster much improved communications and efficiency among its large group of professional and support personnel whose work spans the globe.

NAVENVIRHLTHCEN has dedicated its new facility to George Marion Lawton, M.D., a pioneer in Navy occupational health and the Center's Officer in Charge from July 1971 to July 1974. Dr. Lawton provided the organizational foundation for today's NAVENVIRHLTHCEN and nurturance for its early development. His first experience with the Center was 25 years ago at its inception as part of the Medical Department, Naval Ammunition Depot, Crane. Subsequently, as its Officer in Charge and as the Bureau of Medicine and Surgery's Director, Occupational Environmental Health Division and Deputy Director, Occupational and Preventive Medicine Division, Dr. Lawton's influence and guidance were directly felt by the command through 1978, and his spirit has remained constant there since.

At the ceremony, CAPT James J. Edwards, MC, commanding officer, presented Dr. Lawton with a dedication plaque in honor of his longstanding vision for NAVENVIRHLTHCEN—a vision which has been realized with the dedication of the new facility. □

—NAVENVIRHLTHCEN, Norfolk, VA.

Dr. Dinsmore's Souvenir

CAPT Harry H. Dinsmore, MC, USN (Ret.)

Photo by the Editor

Dr. Dinsmore today

One of the most curious photographs in the BUMED Archives is an x-ray from the Vietnam War showing a mortar shell lodged beside the victim's chest wall. The patient, a South Vietnamese soldier, had been riding in an armored personnel carrier near Da Nang in the late afternoon of 1 Oct 1966 when he spotted a Viet Cong mortar squad. It was already too late. A Soviet bloc-made 60 mm round struck the open hatch, deflected off his steel helmet, penetrated soft tissue between collarbone and shoulder, then plunged beneath his skin before coming to rest below the left armpit. Within minutes, his comrades rushed him, still conscious but terrified, to the nearby U.S. Naval Support Activity Hospital. CAPT Harry H. Dinsmore, MC (Ret.), describes what happened next.

I was eating my evening meal in the officers' mess hall at about 5:30 p.m. on the evening of 1 Oct 1966. The mess hall was located a few hundred yards away from the Mass Casualty Center (MCC), where many of our casualties arrived by helicopter. I was just finishing when the officer-of-the-day walked in with an X-ray in his hand. I vividly recall thinking my colleagues were playing a trick on me as we sometimes did to each other to break the boredom. I was assured it was no trick, and the patient was at that moment in the MCC. I and several other physicians hurried down there to take a look.

An ARVN (Army of the Republic of Vietnam) soldier, Nguyen Van Loung, age 22, was conscious and had no wounds other than the entrance wound in the anterior aspect of his left shoulder and the obvious 60 mm mortar round beneath the skin of his left anterior chest wall. His heavy denim army shirt was pulled into the wound and, as later turned out, was badly entangled in the mortar round's tail fins. Most of the shirt had been cut away by the time he arrived. It was immediately obvious what had to be done.

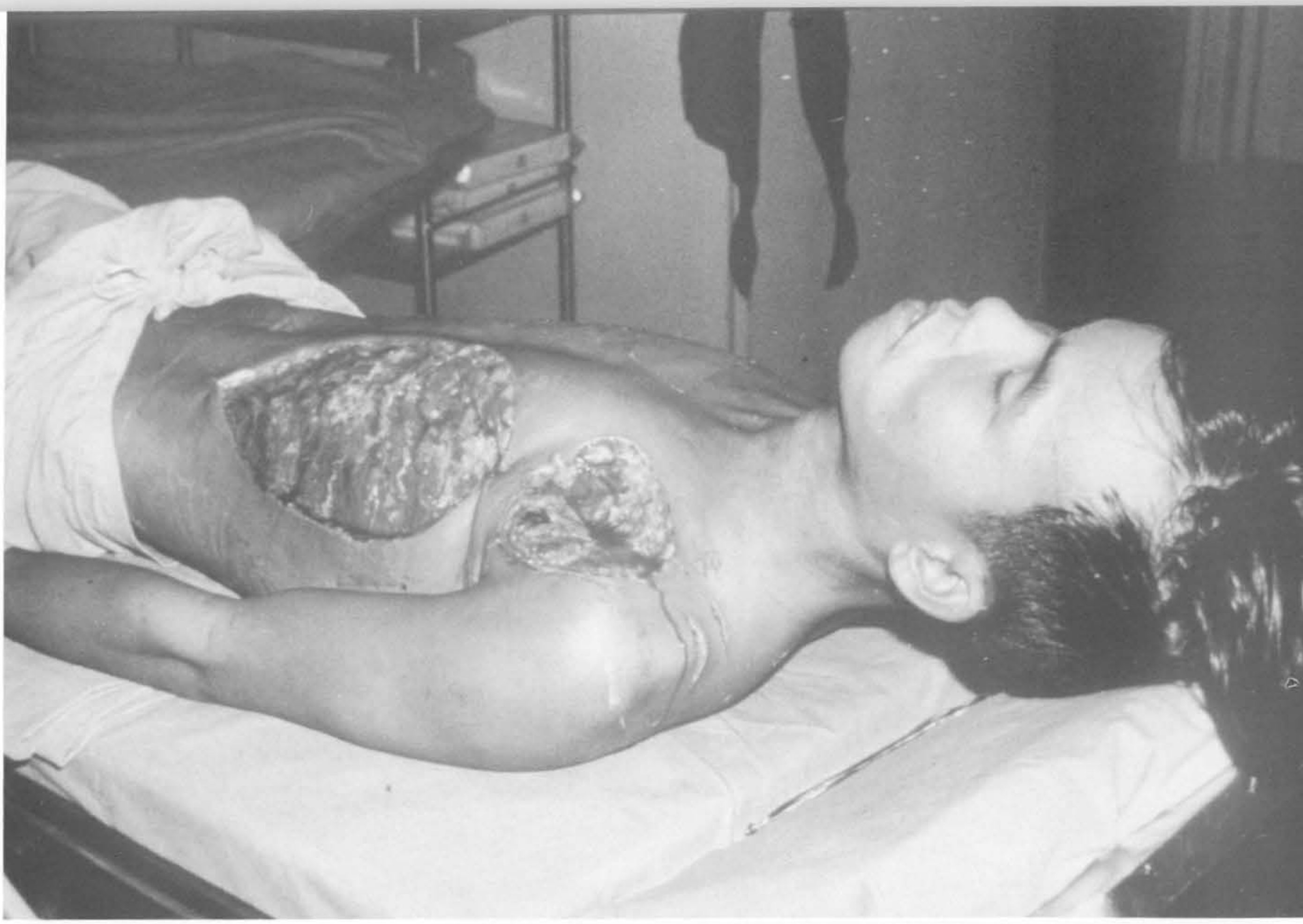
I was chief of surgery and the senior

Photos courtesy Dr. Harry H. Dinsmore

surgical officer present. However, I did not have the first surgical call. Although there were three to four other general surgeons on my staff, with the gravity of this situation, I felt that I could not ask or order anyone else to do the surgery.

We called the Navy Ordnance Depot and told them our problem. They agreed to send a demolition expert to the hospital. He arrived about 20 minutes later. When shown the patient, Engineman First Class John Lyons just shook his head in disbelief. The round, he stated, contained between 1 and 2 pounds of TNT. After measuring the firing pin on the X-ray, he pointed out that it was already partially depressed. The round could go

Top: Loung with 60 mm mortar round embedded in left chest wall awaits surgery the evening of 1 Oct 1966. _Right:_ Patient, ordnance expert John Lyons, and Dr. Dinsmore pose for the press following the newsmaking surgery.



Above: **Loung awaits skin-grafting procedure 7 days following the removal of the mortar round.** ***Right:*** **Dr. Dinsmore completes the graft.**

off at any time even without being handled!

In the meantime, several corpsmen and others were starting to position sandbags around the operating table in the OR at one end of a Quonset hut. However, their activity was stopped for two reasons. One, the round was of such a size that it could not be held in place with an instrument during surgery, but had to be hand-held. There was no way this could be done from behind sandbags. The second reason was the more determining one. Lyons told us that sandbags would do no good. If the round went off, the whole Quonset hut would be gone!

The patient was taken to the operating room by stretcher, and I never saw such careful, tiptoeing stretcher carriers. They placed him on the operating table, stretcher and all. He was sedated, given a general anesthetic by our anesthesiologist, LT Jerry Warren, intubated, and then attached to the Bird machine, an automatic respirator. Warren then left. I had decided that no one should be there who didn't have to be. Several corpsmen—OR techs—volunteered to assist me and, while I was in the locker room changing clothes, one of the

Loung flanked by his surgeon, Dr. Dinsmore (right), and LT Dick Virgilio 1 month postop. *Below:* On 19 Feb 1967, CAPT Dinsmore received the Navy Cross and congratulations from GEN William Westmoreland.

other surgeons offered to do the surgery. He could see how scared I was. The OR techs set up the Mayo trays and then left. I decided that only Lyons and I would stay. Lyons would take the round and disarm it after removal.

I chose not to do a skin prep; Lyons urged that there be no movement of the round within the tissue, no twisting or lateral motion. He felt the round should not be moved at all until it was lifted straight from the chest wall. To accomplish that end, I planned to make an elliptical incision completely around and away from the mortar shell. I proceeded with the surgery.

When the round had been completely encircled, I lifted it with the overlying soft tissues directly away from the chest wall, thinking every second that my world was going to end, as the shell was just a foot from my face.

Just then, a major problem became evident. As the shell came away from the chest wall, I felt something restraining it. The patient's blood-soaked shirt, which was also firmly trapped within the entrance wound, was badly entangled in the mortar round's tail fins. With a Mayo scissors, the heaviest we had, I spent an additional, harrowing 10 minutes cutting through multiple folds of heavy, wet cloth to get it free. I handed the shell, with the surrounding tissues, to Lyons and then hurried over to open the door for him. He took the round to a nearby sand dune, where he defused it and emptied the TNT. He later returned it to me as a keepsake.

This entire procedure had taken about a half hour. The OR techs then returned. After regloving, I completed the procedure by obtaining hemostasis, removing the remaining cloth fragments, and further debriding the wound, all accompanied by copious irrigation. This took about an additional 30 minutes, but that part of it I barely remember. We applied sterile dressings; skin grafting was planned for later.

The patient's postoperative course was uneventful, and he was very grateful. The wounds were closed with split-thickness grafts about a week later, which took well and healing progressed satisfactorily. There was some resultant weakness of the left shoulder because of the loss of a portion of greater pectoral muscle, but the functional result was good. The patient returned to full-duty status within 2 months.

For his heroic performance, CAPT Dinsmore was awarded the Navy Cross. □

Dr. Dinsmore practices surgery in Punxsutawney, PA.

Total Quality Management:

Mandate For Change

CDR William J. Lambert, Jr., MSC, USN
LT Richard P. Beaudoin, MSC, USN

"We will commit to excellence, to a relentless pursuit of continuous improvement, and to removing barriers to increased performance, productivity, and timeliness in all that we do." —SECNAV, CNO, and CMC(*1*)

What is the nature of this commitment our Navy Department leadership has laid down for us? What is driving it? How is it expected to occur? The short answer is that the "commitment" is to implement something called total quality management (TQM). It is being driven by a presidential mandate to establish a "productivity improvement program for the federal government . . . to improve the quality, timeliness, and efficiency of [government] services by . . . 1991."(*2*)

The Department of the Navy (DON) expects TQM to become part of our management philosophy and processes through education, training, day-to-day operations, and leadership. According to DON, this "requires commitment and involvement of managers at all levels."(*3*)

This article reviews the Department of Defense (DOD) mandate for a TQM program, discusses key features of the TQM concept, and highlights the involvement of Navy medicine.

TQM officially began with the DOD community when a Departmental "Posture on Quality" was issued 30 March 1988.(*4*) In August 1988, a TQM Master Plan was published, outlining how the Department intended to implement it's part of the federal program. The "DOD strategy" for TQM "aims at achieving . . . continuous improvement of products and services . . . [across] the breadth of DOD activities." "Products and services" include "everything that DOD does, every action that is taken, every system that exists, [and] involves processes and products that can be improved or services that may be performed more efficiently."(*5*)

Although acquisition and engineering functions received much of the initial attention in the program, human resources and support services (including health care) are now being brought into focus as well. "The DON is implementing TQM as the top priority initiative to achieve performance improvement on a continuing basis."(*6*) A DON TQM implementation plan was published 4 Nov 1988. According to this plan, medical and dental care activities are to implement TQM by 1990.(*7*)

What is TQM?

As a concept, TQM has been around for more than 40 years, thanks to the pioneering efforts of W. Edward Deming,(*8*) J.H. Juran,(*9*) and others. The management processes employed by these individuals have been credited with the industrial miracle achieved by Japan in recent years. A number of major American manufacturing firms have applied the concept with impressive results. Only within the past few years, however, have the service industries begun to apply TQM principles in a formal way. The

health care industry is just beginning to get on the bandwagon, frequently under the banner of "productivity improvement."(*10*) The key features, or principles, of TQM may be summarized as follows:

- **Strategy Development and Execution.** This involves looking at the environment or situation relative to a particular mission, assessing the alternatives acceptable for meeting the mission, deriving the most effective and efficient pathways, putting together a plan of action for proceeding, and monitoring progress. This process should look familiar to those who have worked with strategic planning. If done successfully, it should yield a refined mission, organizational goals and objectives, and a long-range vision about where the organization should be in a number of years from now. Organizations that lack coherent, articulated, long-range vision and congruent goals tend not to be able to focus on product improvement or quality concerns. Strategy development is, therefore, an essential first step in TQM implementation.
- **A Commitment to Quality.** The admonition associated with this principle of TQM is "do it right the first time." In the health care arena the need for identifiable and measurable outcomes is not an alien concept. A lot of attention is accorded to "quality control," or "quality assurance," but it is generally applied in a piecemeal fashion. In TQM, the commitment to quality must be all encompassing. Indicators of quality need to be established for each service or facet of service provided. Evaluations and improvement goals need to be measured against these indicators. Management needs to ensure that this aspect is a part of the strategy-making and the goals and objectives development process. The "crew" must accept the commitment to quality as their primary organizational purpose. Finally, there must be a process for *continuous improvement*. Problems, or deviations from the ideal, need to be recognizable through quality control processes, and methods for correction or improvement locked in place. The latter process is facilitated by a climate which encourages innovation.
- **Process Orientation.** Process involves the way we get things done. It includes both the tools used and the way they are applied. Incoming materials or supplies must meet specifications, production outcomes must be within the quality control range, and the product or service must measure up to performance standards. Finally, the product must meet the customer's expectations. All phases of a process must be clearly identified and systemically controlled through measurable standards.
- **An Emphasis on Outcome Measurement.** This is a distinctive feature of TQM and separates it from many other forms of management techniques. It involves the use of statistical tools to plan, measure, and evaluate system and product quality. The use of microcomputers to assist in applying statistics, tracking quality indicators, and aiding in systems and decision analysis is almost essential. On the other hand, much of the planning necessary to institute TQM does not require computer or statistical applications. A rule of thumb is that the planning and development associated with TQM relies heavily upon qualitative techniques, while product or service output evaluation places emphasis on quantitative analysis.
- **Orientation to Human Resources.** A sound employee relations and benefits package, which is perceived to be equitable and competitive, is an important component of any human resources program. Such a package emphasizes that people are the key to quality output. However, TQM also cashes in on the desire of people to make a worthwhile contribution to a good product, and the need to feel they are a part of an organization which is known for the quality of its products. Involvement of people at the lowest possible level of production is considered essential. Quality circles, recognition and awards programs, bottom-up planning, and innovation-sensitive programs are some of the recommended ways of getting people involved. Appropriate delegation and support for individual initiative are vital.
- **Customer Orientation.** According to TQM philosophy, the customer is *the* reason for existence. He/she is considered to be the best judge of the ultimate value of the services provided. There are two levels of customer orientation—internal and external. The *internal customer* uses the services of the rest of the organization. In the health care facility these include people working in areas such as benefits, public relations, recreation, education programs, housekeeping, supply, food service, and ancillary clinical services (laboratory, staff clinic). Someone is always the customer of someone else and needs to be treated as such. The *external customer* is the individual or organization outside of the facility that uses the services produced. In Navy medicine external customers include not only actual patients, but all authorized beneficiaries, the "line community," and collegiate organizations such as other federal and civilian health care services. In other words, all of the people who are in a position to use our product and judge its quality by their perceptions and their standards.

Navy Medicine and TQM

The Navy medical community formally began the task of implementing TQM in the spring of 1989 when the Commander, Naval Medical Command appointed CAPT Robert K. Zentmyer, MSC, to coordinate the program and sent a message on TQM to our top leadership in the field.(11) This initiative began a process that has yielded a set of "guiding principles" to serve as "the base upon which we can build a strategic plan for the Navy Medical Department and . . . [to] serve as a common set of values towards the continuous improvement goal of Total Quality Management."(*12*) The organizational structure for guiding the TQM effort is thus linked to the areas of innovation and strategic planning at the Bureau of Medicine and Surgery level (BUMED 00Z). This approach fits well into the TQM framework and is necessary for its success.

Concluding Observations

TQM is both a management philosophy and a process for achieving quality. It incorporates a number of management concepts that have been developed and tested over the years, such as industrial management engineering, motivation theory, and management by objectives.

TQM must be an ongoing, total corporate project, with goals and objectives formulated for both the organization and the services provided. This needs to be done with the collaboration of those responsible for the product or service.

TQM has worked well in manufacturing industries and in procurement processes. Health care organizations present a special challenge, however, because of their unique corporate cultures and other organizational complexities. The special environments of government and military cultures compound the situation, so that implementing TQM can task the imagination and leadership abilities of the best change managers. At the same time, this situation presents a special opportunity to initiate the new TQM philosophy, which "will require fundamental changes in the way we manage and in the way we perform our daily tasks."(*13*) This is a key point and needs to be understood if TQM is to succeed. The TQM approach to management involves not only changes in attitudes and style, but also requires understanding and patience. Although some benefits of TQM may become apparent within months, most organizations do not realize fundamental improvements until 3-5 years have passed.

TQM is not something that can be put on automatic pilot. Successful implementation and long-term integration of a TQM program requires that leadership, supervisory, and staff personnel at all levels and activities continuously work to become acquainted with the benefits, principles, and processes of the concept. An organization and leadership structure must be established that ensures continued optimal coordination and integration of TQM with innovation, strategic planning, and organizational change efforts. This "strategic management" approach will establish a focus for continuous improvement as well as survival of the process within Navy medicine.

References

1. Webb JH Jr, Trost CAH, Gray AM: *Productivity Improvement Guiding Principles.* Department of the Navy, 1987.

2. Reagan R: Productivity improvement program for the Federal Government (Executive Order 12637 of April 27, 1988). Note: This supersedes E.O. 12552, Feb 25, 1986, which initiated the federal productivity improvement/TQM effort. *Federal Register,* April 29, 1988, pp 15349-15351.

3. Hoffmann GC: *Total Quality Management.* Department of Navy Memorandum, Specification Control Advocate General of the Navy, Dec 20, 1988.

4. Carlucci FC: *Department of Defense Posture on Quality.* DOD Memorandum, Secretary of Defense, March 30, 1988.

5. *Total Quality Management Master Plan,* Department of Defense, Aug 1988.

6. Garrett LH III: *Total Quality Management (TQM).* Department of Navy Memorandum, Under Secretary of the Navy, Nov 8, 1988.

7. Garrett LH III: *Department of the Navy Total Quality Management Implementation Plan.* Department of Navy Memorandum, Under Secretary of the Navy, Nov 4, 1988.

8. Deming WE: *Out of Crisis.* Cambridge, MA, Institute of Technology, Center for Advanced Engineering, 1986. Also, Walton M: *The Deming Management Method.* New York, The Putnam Publishing Group, 1986.

9. Juran JM: *Managerial Breakthrough: A New Concept of the Manager's Job.* New York, McGraw-Hill Book Co, 1964. Also, Juran JM: *Juran on Planning for Quality.* New York, The Free Press, 1988.

10. Berwick DM: Continuous improvement as an ideal in health care. *N Engl J Med* 320:53-56, Jan 5, 1989.

11. Commander, Naval Medical Command: *Guiding Principles for Navy Medical Department.* Message: R 031400Z, May 1989.

12. Zimble JA: *Total Quality Management.* Bureau of Medicine and Surgery Memorandum (5250: Ser:00Z/011), Surgeon General of the Navy, Aug 22, 1989.

13. Hoffmann, op. cit. □

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A Prospective Role in Navy Medicine

Medical Anthropology

Bruce H. Grant

Anthropology has come of age. No longer is it relegated to bespectacled professors examining fossils in dusty museums or studying primitive tribes in faraway places. These stereotypical notions have given way to a new breed of anthropologists—applying theories and expertise to solving practical problems. Nowhere is this more evident than in the emerging field of medical anthropology. It stands uniquely at the crossroads of medicine and culture and offers new and creative insights into some of the pressing concerns of health and disease.

As a subdiscipline of anthropology—the science of man in all his biocultural dynamics—medical anthropology is concerned with the interrelation of behavioral and biomedical factors that impinge on health and health care. It emphasizes the notion that health and disease are as much a social and cultural phenomenon as a biological phenomenon. Two salient features characterize its scope: beliefs and patterns of human behavior. The former involves the ethos, values, and systems of meaning among different cultures; the latter includes kinship and social structure, economic and political organization, and forms of social interaction. Both are integral to the functioning of any society or culture and influence the ways in which sickness and health are perceived and managed. These perceptions and practices vary enormously and must be carefully considered to ensure the success of any health care program.

The strongest asset of medical anthropology is its holistic approach to health and disease. Environmental, epidemiological, clinical, and sociocultural data are all grist to the medical anthropologist. Each of the data is interpreted in an overall context of the environment, the individual, culture, and disease to achieve greater understanding of specific health-related problems. It is the elicitation of the complex "causal network" of disease etiology and transmission, rather than specific behavioral or categorical determinants of disease (the domain of epidemiology), which holds the greatest promise for medical anthropology.(*1*)

Anthropological Research Methods

Unlike the more quantitative research methods of epidemiology, anthropological research methods are primarily qualitative. Rather than administer survey questionnaires to large samples of a target population, anthropologists resort to "ethnographic" or culturally descriptive methods such as participant-observation, in-depth interviews, life histories, and the use of key informants. Unfortunately, clinicians and biomedical researchers are often uncomfortable with these methods. Unless data is quantified and statistically analyzed, they often feel it is insignificant,

"nonscientific," or too abstract for meaningful application. Nothing could be further from the truth.

Qualitative methods, using smaller numbers of people, focused on a specific problem, and less rigidly designed often afford great validity and utility.(*2*) The descriptive data yielded by qualitative research methods provides a behavioral context in which to interpret quantitative data. Not only does the anthropological approach "ground" statistical data in cultural reality,(*3*) it may also help in the identification of potential health problems.

Disease Control

One important area for the application of anthropology is disease control. The transmission of disease is often influenced by many sociocultural factors such as kinship structure, sleeping arrangements, house design, water and waste management, dietary customs, migration and settlement patterns, child-rearing methods, agricultural techniques, religious practices, and beliefs about the etiology of diseases (such as witchcraft, sorcery, and possession). These factors are often best explained by anthropological research.

Malaria, for instance, has been of long interest to medical anthropology. International eradication efforts have, for the most part, failed. While it is becoming apparent that malaria may never be eradicated, control of the disease will also likely prove elusive if only reductionist, technological measures are used. To address this dilemma, attention is being increasingly directed at the sociocultural variables that affect and influence control efforts.(*4*) The technological focus of antimalarial campaigns (i.e., residual insecticide application, ecology control, chemotherapy, etc.) frequently precludes community involvement and participation, elements that require an analysis of the social structures and cultural norms of indigenous populations. More integrated and holistic approaches to malaria control planning may help ensure the social soundness, local receptivity, and overall effectiveness of program efforts.

The Navy Context

How, precisely, can medical anthropology be of use in Navy medicine? Due to its sociocultural emphasis on disease causation, qualitative research methods providing descriptive information, and a holistic orientation to health problems, medical anthropology can directly contribute to the mission of the Navy Medical Department in many ways. Programs dealing with sexually transmitted diseases, tuberculosis, malaria, or other diseases of military importance can be improved by the medical anthropologist. Environmental modification efforts (e.g., water, wastewater, and solid waste management), food service sanitation, and vector control programs can also be improved by anthropological expertise. Education efforts directed at Navy personnel, their dependents, and the local community—dealing with issues from substance abuse to stress reduction—can also benefit from anthropological insights.

In assessing the role that medical anthropologists can perform in the Navy, it is important to realize that Navy personnel do not operate in a vacuum. Ashore or afloat, the health and welfare of the naval forces is to a large extent determined by the local communities and indigenous peoples with whom they interact; therefore, this must always be considered in any prevention program.

At shore stations in the United States or overseas, interaction with "locals" may adversely affect the health of Navy personnel; poor housing, unhealthy or improperly prepared foods, unsanitary conditions, contaminated water, and intimate contact with diseased individuals may exact their toll. Aboard ship, contact with "locals"—once liberty is called—may jeopardize the crew's health and impair the ship's operational effectiveness. This is especially true if ports are visited or areas are transited where infectious diseases are endemic and/or epidemic.

Ethnic diversity and differing lifestyles of personnel *within* the Navy must also be considered. Increasing numbers of Navy personnel are Hispanic or Asian, and other minorities, including blacks and women, are entering the Navy in greater proportions. These groups invariably have unique health care needs related to their sociocultural backgrounds.

Navy personnel cannot be seen in isolation from their particular sociocultural or ecological milieu. The need for gathering and analyzing data that is cognizant of this interaction, as well as recognizing the health care needs of minority groups in the Navy, is of central importance for the continued success of the Navy's preventive medicine agenda.

The medical anthropologist is ideally qualified to assist in the design, implementation, and maintenance of preventive medicine or other health care programs. This includes:

- Identifying groups at high risk for specific diseases.
- Assessing the scope of particular health-related problems.
- Focusing the goals and objectives of prevention programs.
- Culturally sensitizing measurement instruments used in epidemiological surveillance.
- Coordinating program efforts.
- Evaluating program effectiveness.

The Medical Service Corps

Medical anthropologists, commissioned as officers in the Medical Service Corps, can join forces with the epidemiologist, entomologist, parasitologist, and environmental health officer as well as the physician, nurse, and corpsman. Appropriate duty stations include:

- Navy Environmental and Preventive Medicine Units (NEPMU).
- Naval Medical Research Units (NAMRU).

• Disease Vector and Ecology Control Centers (DVECC).
• The Preventive Medicine Service of naval hospitals.

Within these organizational units, medical anthropologists can become an integral part of the Navy Medical Department. The following are examples of specific tasks which may be delegated to a medical anthropologist:

• Assess the behavioral aspects of selected infectious and parasitic diseases.
• Provide consultation to medical personnel treating culturally diverse patients.
• Gather and analyze biosocial data pertaining to substance abuse among Navy personnel.
• Explore ways to improve chemoprophylaxis compliance and "malaria discipline" among Navy personnel in malaria endemic areas.
• Conduct Health Risk Appraisals for the Physical Fitness Program and determine appropriate methods for participants to modify behavior.
• Function as a medical intermediary between overseas stations and indigenous populations.

This list is by no means exhaustive. The potential duties and responsibilities of medical anthropologists in the Navy Medical Department are extensive and wide-ranging.

Conclusion

Navy medicine has a long tradition of excellence. For more than 100 years, it has been a leader in preventive medicine and applied biomedical research. To maintain this tradition and fulfill its mission, the Navy Medical Department must continue to explore the potential for the application of new and innovative biosocial and medical knowledge. The incorporation of medical anthropologists into the Navy Medical Department is timely and appropriate. It promises to be a creative union directly benefiting the health and operational readiness of the naval forces.

References

1. Dunn FL, Janes CR: Introduction: Medical anthropology and epidemiology, in Janes CR, et al (eds): *Anthropology and Epidemiology*. Dordrecht, Netherlands, D Reidel, 1986, pp 3-34.
2. Buzzard S: Appropriate research in primary health care: An anthropologist's view. *Soc Sci Med* 19(3):273-277, 1984.
3. Nations MK: Epidemiological research on infectious disease: Quantitative rigor or rigormortis? Insights From Ethnomedicine, in Janes CR, et al (eds): *Anthropology and Epidemiology*. Dordrecht, Netherlands, D Reidel, 1986, pp 97-123.
4. Ault S: Anthropological aspects of malaria control planning in Sri Lanka. *Med Anthropol* 7(2):27-50, 1983. □

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Navy Nurse's Ambulatory Care Symposium

The 2nd Annual Navy Nurse Corps Ambulatory Care Symposium and dinner will meet 13-14 March 1990 at the Bally Hotel in Reno, NV.

The dinner on the 13th and the 1-day symposium the following day will be held in conjunction with the 15th Annual National Conference of the American Academy of Ambulatory Nursing Administration (AAANA). The symposium is open to all active duty, selected reserve, and retired Nurse Corps officers practicing in ambulatory care.

The symposium provides a forum for ambulatory nurses to network and exchange ideas and acquire new insights for solving common health care problems. Samples of AAANA Nursing Administration and Practice Standards which have been implemented with naval medical treatment facilities (MTFs) will also be available for sharing.

For more information and registration forms contact: CDR Jane W. Swanson, Washington Navy Yard Branch Medical Clinic, Washington, DC 20374-1832. Telephone: Autovon 288-3492, Commercial (202) 433-3493/94.

PH3 Dillon

Stretcher team preparing for trolley/litter transport.

Transportation of Litter Patients in USS *Missouri*

CDR Jack W. Smith, MC, USN
LT Murray C. Norcross, MC, USN
LT S. William Elwood, MC, USN

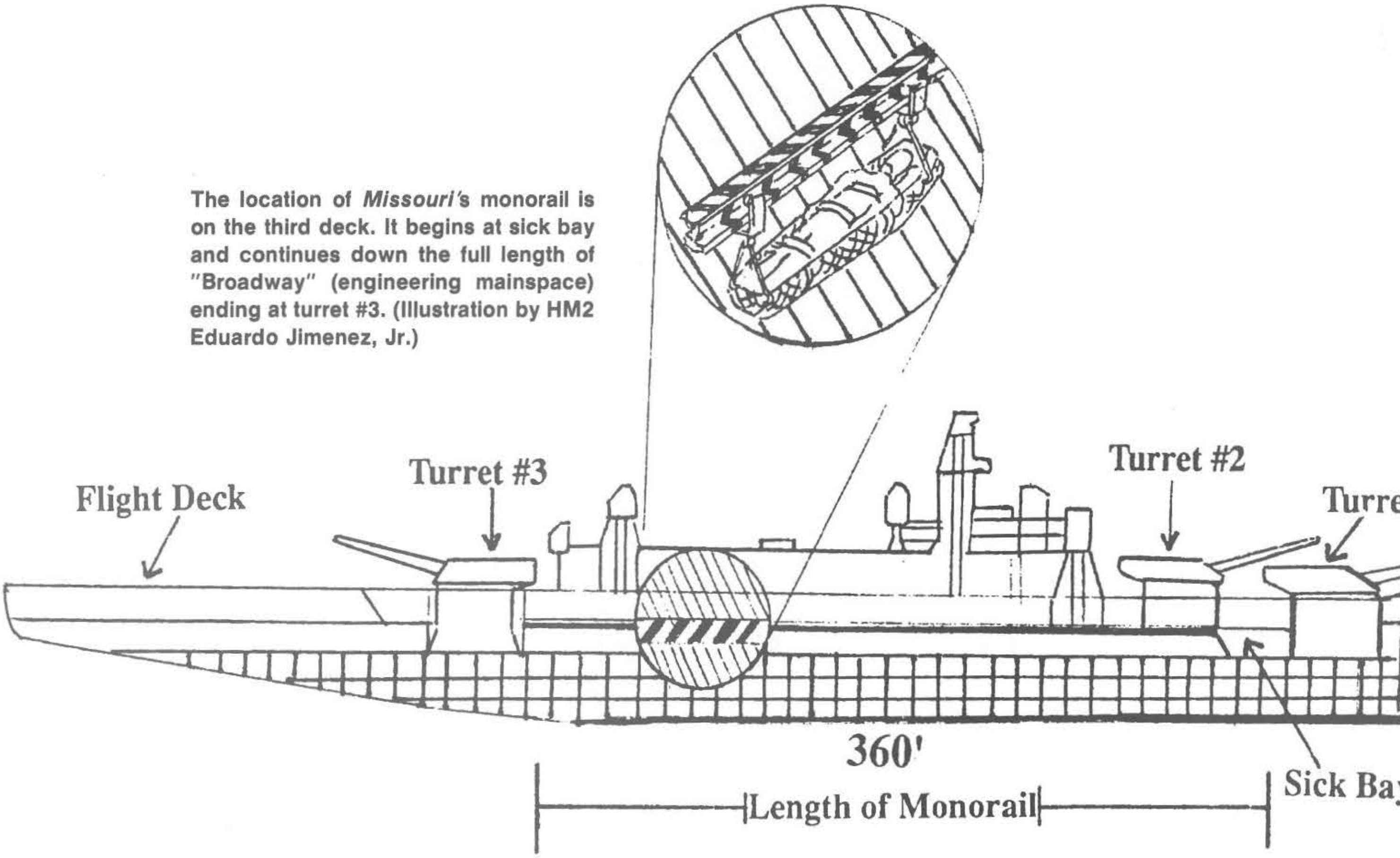
The reactivation of the *Iowa* class battleships has captured the imaginations of a new generation of sailors who have the opportunity to serve in these modernized dreadnaughts. Graceful, mighty, and awe-inspiring, their decks echo the events of American naval history from World War II to the present. The lure of serving on USS *Missouri* (BB-63), the ship upon which the surrender ending World War II was signed in 1945, has been irresistible for many Navy men, and physicians are not immune.

Missouri, like the other ships in the class, was built in the early 1940's and designed to fight and survive in battle with the most powerful Japanese battleships of that era. In order to allow these ships to survive and fight after direct hits by the huge shells of the world's largest naval guns, their design included heavy armor as thick as 17 inches in places and a redundancy of ship systems rare in most warships today. Now, with their 5- and 16-inch gun systems augmented by the addition of Harpoon and Tomahawk missiles, these rugged and reliable behemoths have returned to service to respond to the threat of antiship cruise missiles and to reinforce our carrier battle groups in the projection of sea power.

However, the very features which make these battleships such excellent and survivable weapons platforms in armed conflict (i.e., heavy armor and extensive compartmentalization) create special problems for the movement of the sick and injured within the ship. Unlike more modern large ships having equipment elevators that may be used to transport patients between decks (LHA's have a dedicated medical elevator), litter patients on *Missouri* must still be hauled up and down ladders using ropes, stretchers, and muscle.

Missouri's sick bay is located on the third deck between turrets 1 and 2 (see illustration) and can only be reached by descending two nearly vertical ladders into the "armored box." Sick bay contains a 20-bed ward, an operating room, a laboratory, and an X-ray facility.

The location of *Missouri's* monorail is on the third deck. It begins at sick bay and continues down the full length of "Broadway" (engineering mainspace) ending at turret #3. (Illustration by HM2 Eduardo Jimenez, Jr.)



Once the third deck is reached, depending upon where he entered the ship, the patient must usually still traverse numerous obstacles including winding, narrow passageways and many of the infamous "knee knockers" —fittings for watertight hatches only 27 inches wide and so called for the placement of their lower edge between 8 and 24 inches from the deck. The movement of injured and ill personnel through this veritable obstacle course is a challenging, backbreaking, and time-consuming chore requiring four trained stretcher bearers for each litter case.

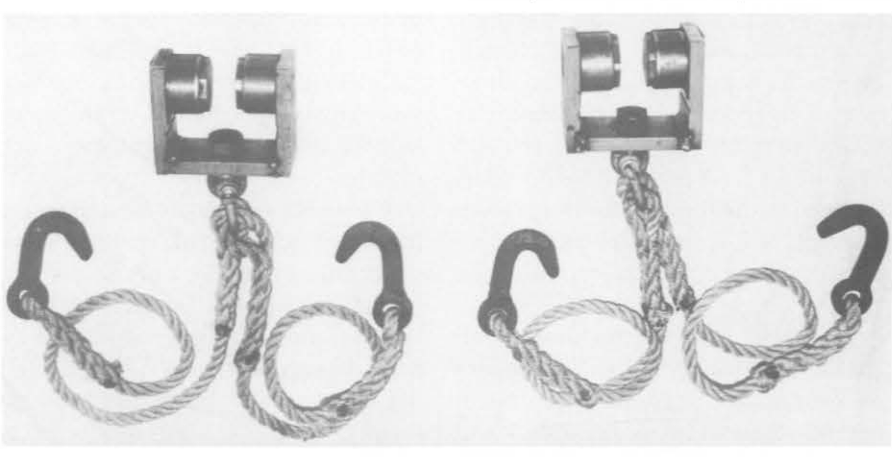
During general quarters evolutions (the highest level of shipboard combat readiness), injured or ill personnel are triaged and stabilized at the nearest battle dressing station (BDS) until movement to main sick bay can be accomplished. On *Missouri,* besides main sick bay, BDSs are located on the main deck forward in the wardroom (officer dining room), on the second deck aft on the crew's mess deck, and on the third deck on "Broadway" to serve the engine rooms.

In the event of a mass casualty situation, injured personnel are moved in order of triage category to main sick bay as soon as operationally feasible. Should numbers of casualties in excess ward capacity be sustained, berthing areas attended by medical personnel would be utilized as temporary medical wards for the less seriously injured.

In addition to the movement of patients within the ship, casualties from other ships may be received when the ship operates as the centerpiece of a battleship battle group (BBG). In this situation, patients would be received mostly by helicopter medevac from smaller or less medically capable ships.

Missouri's flight deck is located on the fantail. Depending upon the

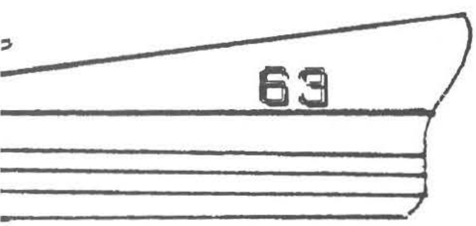
Trolleys with attached ropes and hooks



PH3 Dillon

number of patients and the nature of their injuries they may be triaged and stabilized at the aft BDS or in some circumstances, weather permitting, might be carried forward on the weather decks before entering the ship to avoid the maze of hatches and passageways within. However, this option would not be available in heavy weather or in certain operational environments.

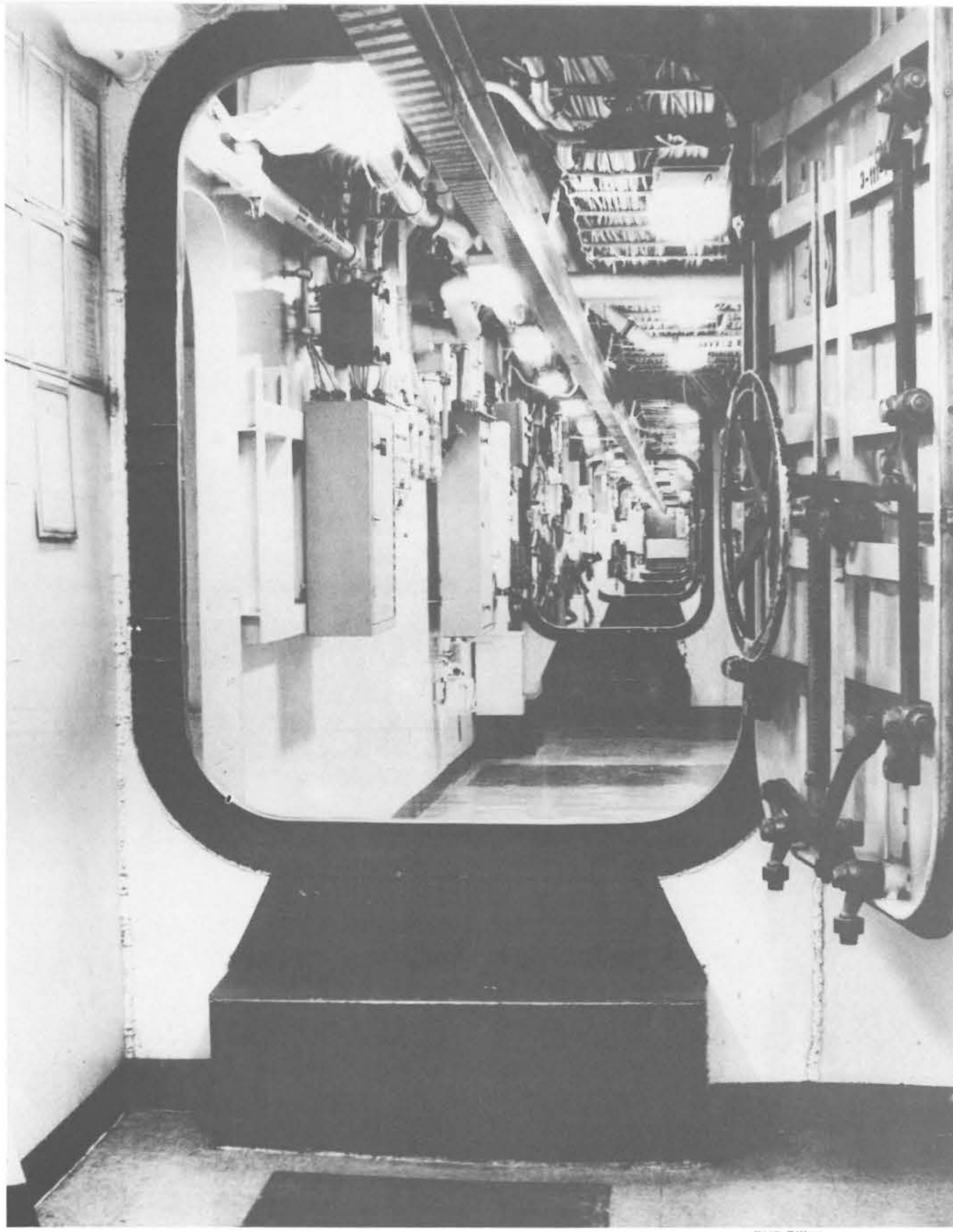
During "Earnest Will" operations in the North Arabian Sea late in 1987, the



transportation of litter patients by trained stretcher bearer teams from the aft BDS to main sick bay using Stokes litters required an average of 25-30 minutes. Although further training and practice might result in some small time savings, this was considered to be an excessive delay for any but most stable patients since provision of medical care enroute is virtually impossible. We therefore sought a means of improving upon the movement of casualties within the ship.

Our solution to this problem is simple. It uses existing equipment and structures within the ship, utilizes only a few items of special equipment within the capability of ship's force to fabricate, and cuts the time of transport by half.

All *Iowa* class battleships have a monorail running more than 360 feet along the third deck from turret 2 (in main sick bay) to turret 3 just forward of the aft mess deck. This rail was designed for the movement of powder, projectiles, and equipment between the 16-inch gun turrets forward and aft. Heavy engineering equipment may also be moved between points along the rail which has removable sections to allow for closure of watertight hatches during general quarters, but which can be set up and fully functional within a matter of minutes.


PH3 Dillon

***Missouri's* "Broadway" in engineering spaces, showing monorail.**

With the assistance and expertise of *Missouri*'s engineering department, two rolling trolleys were constructed (see photograph). To hold the litter, hooks with an eyelet for rope or cable attachments were cut from ¼-inch steel plates, and then attached to the trolley by triple strand nylon rope with the assistance of the boatswain's mates of the ship's deck force. When connected to the rail, a litter could now be moved along the rail above the "knee knockers" with relative ease and speed. Initially, only Stokes litters were used on the system, but Neil-Robinson and Miller-Abbot stretchers have subsequently been used with similar success.

We have continued to use four stretcher bearers with the rail system to assure safety in case of equipment failure, but the modification of the equipment to utilize climber's D-rings with safety snaps, two stretcher bearers should be able to safely transport each patient. Since "Broadway," the space which the rail traverses is much wider than other passageways in the ship, it offers additional advantage of room for a medical attendant to pro-

Battleship *Missouri* in action

vide attention for or closer monitoring of the patient along the way. The savings in time of transport and effort required by the stretcher bearers have been significant, and the discomfort of the trip for the litter patient has actually been reduced for the rail portion of the trip.

A few minor problems have been encountered using the rail system. Most obvious, the rail cannot be used during general quarters or other evolutions in which full watertight integrity is vital. In addition, we found that because the rail is seldom used, paint chips fall onto the patient necessitating the use of safety goggles or a face shield. Finally, practice and coordination with other departments are required to assemble the rail quickly and smoothly when needed. The greatest benefit so far has been in the transport of medevac litter patients back and forth between the flight deck and *Missouri's* sick bay.

The rail system for patient movement within *Missouri* has been used successfully for both exercises and actual patients for more than 1 year. While it has limited usefulness when actually operating at general quarters, it is very helpful in the movement of patients from the battle dressing station to main sick bay following the relaxation of condition Zebra (all hatches closed), and has proven very effective in expediting the movement of medevac cases from sick bay to the flight deck and vice versa. The time saved through its utilization (greater than 50 percent reduction in transit time from the aft BDS) could prove to be the margin between life and death in the critically ill or injured patient. □

Dr. Smith is USS *Missouri's* senior medical officer. Drs. Norcross and Elwood also serve aboard *Missouri*.

Highlights From the Navy Medical Research and Development Command

Bethesda, MD

• New Prediction Model Relates Helmet Weight to Aircrew Neck Injury Risks

Aircrews of today's high performance tactical aircraft face a significant risk of neck injury during the G maneuvers, hard landings, or emergency egress, a risk which is increased when helmet-mounted sighting systems, night vision goggles, and laser-protective hardware change both the helmet's weight and center of gravity. Until recently, empirically-based guidelines have not been available to predict the likelihood of neck injury under varying conditions of G stress and helmet weight. Now, scientists at the Naval Biodynamics Laboratory (NBDL) in New Orleans, LA, have completed an extensive effort to model the reductions in x-axis G tolerance (-Gx) that are associated with increases in effective head weight. Experimental data curves developed at NBDL predict, for example, that wearing a 3.5-pound aircrew helmet increases the head weight of the average adult male by 37 percent and reduces the -Gx impact tolerance by 26 percent. Night vision goggle systems can raise the total head weight to 7 pounds, reducing the tolerance limits by 42 percent and 45 percent respectively, for male and female aircrew personnel. These data, which are essential for both human factors considerations in helmet design and for risk assessments in Navy air operations, will be extended to include other (e.g., +Gz) acceleration vectors which are other important elements of the Navy aircrew environment.

* * *

• Vascular Anastomoses Without Sutures?

During wartime, large numbers of combat casualties can be expected to require the emergency rejoining (anastomoses) of large blood vessels. Standard suturing of blood vessels can be time consuming and requires skilled surgeons and hospital facilities which will not be available at forward echelons of combat medical care. Funded by a Navy contract, the Johns Hopkins Applied Physics Laboratory, Laurel, MD, is developing a simple, rapid technique for the sutureless anastomosis of severed blood vessels. In this experimental procedure, the proximal and distal ends of a severed vessel are averted over specially designed rings, and then bound together using a vascular graft sleeve which shrinks at body temperature to hold the vascular ends tightly together. The anastomosis instruments and supplies will be packaged into a small, easily carried emergency kit which will be usable, shipboard or in the field, by medical personnel without specialized vascular surgical training.

* * *

• Medical Database Predicts Health Risks for Deployed Sailors and Marines

For more than 20 years the Naval Health Research Center (NHRC) in San Diego, CA, has compiled a unique set of personnel and medical data files on all active duty Navy and Marine Corps personnel, which can be used for determining the disease and occupational injury rates for any segment of the Navy population worldwide. Recent updates to this computerized system have allowed NHRC to analyze effectively the disease risk to all deployed sailors by following every sailor's ship assignment, port visits made by all Navy ships, and the diseases experienced following these visits. Notably, all Navy and Marine Corps personnel who develop seropositivity for the Human Immunodeficiency Virus (HIV) are included in this database, as is a complete history of the clinical course of every HIV infection. NHRC's database provides to Navy medical planners essential information on sailor's risks of incurring HIV infection, other sexually transmitted diseases, and other infectious diseases at every foreign port visited by Navy and Marine Corps forces.

For additional information on these or other medical R&D projects, contact NMRDC Code 40 at Commercial (202) 295-1468 or Autovon 295-1468.

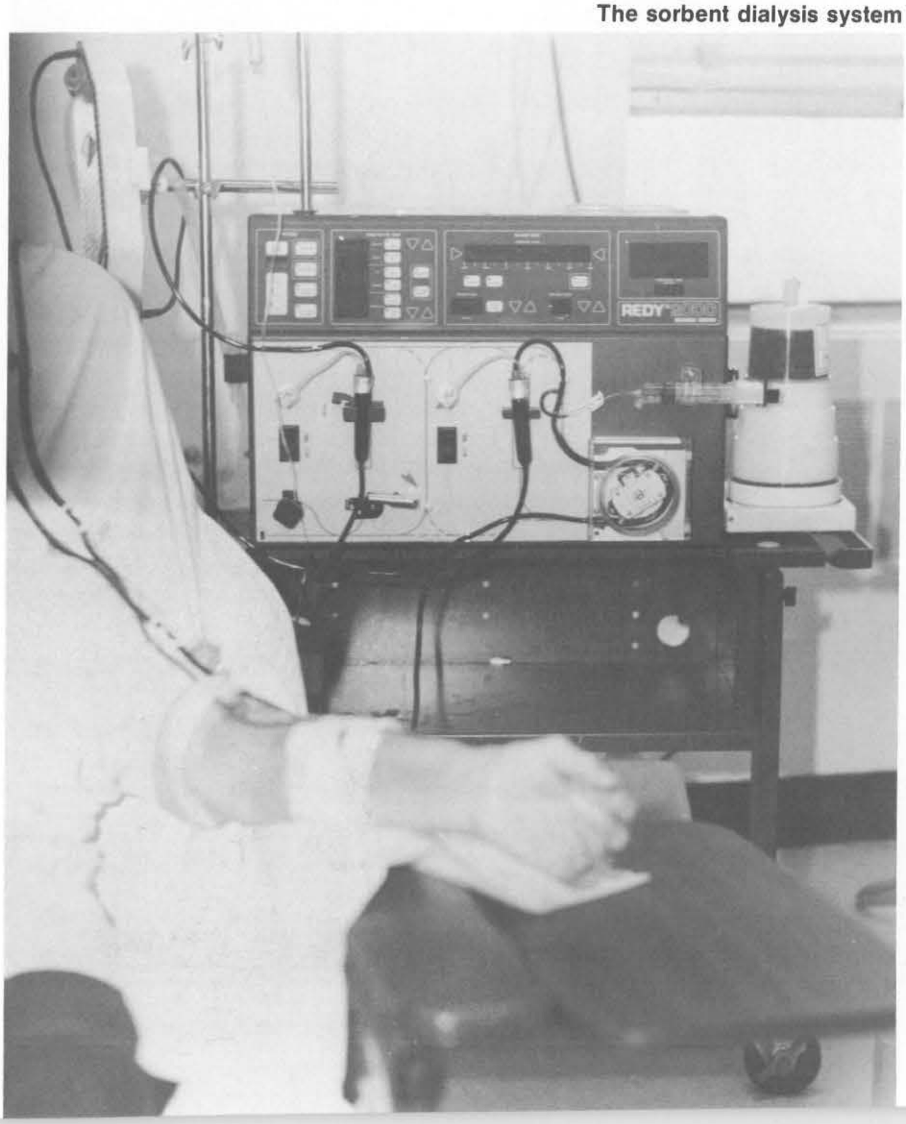
Dialytic Capabilities in the Operational Setting

LCDR David J. Connito, MC, USNR HMC William J. Balko, USN

Death was the usual result of the combat casualty with post-traumatic acute renal failure (PTARF) prior to the Korean War. Although accurate statistics of the incidence and mortality rate of this complication in World War II injuries are not available, it is generally quoted that between 68 and 90 percent in this selected group of patients died.*(1,2)*

It must be realized that the majority of patients with PTARF are gravely ill irrespective of the development of acute renal failure. These casualties have multiple wounds, severe burns, and/or crush injuries with rhabdomyolysis. Protracted shock and sepsis from bacterial contamination contribute to the high mortality rate and increase the risk of developing acute renal failure. Once renal failure develops, the complications associated with it, including hyperkalemia, volume overload, metabolic acidosis, and uremia, further increase the risk of death.*(3)*

The sorbent dialysis system



When a battlefield study of Korean War casualties revealed a significant number of acute renal failure cases, a center for treatment of such was established by the U.S. Army in Wonju, Korea in 1951.*(4)* With its institution, Teschan*(5)* and Smith*(6)* were able to report a decline in mortality rate of 80-90 percent by field estimates to 53 percent for patients treated at the renal center, and the successful management of acute renal failure with dialysis in the combat zone became a reality.

As a consequence of the experience gained in the treatment of PTARF in the Korean War, dialysis support for these patients became more extensive during the Vietnam conflict, and a total of about 300 cases were seen at a number of specialty units. It was during this time, the U.S. Navy hospital ships, USS *Sanctuary* and USS *Repose* were brought into service. On board *Sanctuary*, 18 patients with PTARF were treated, and it was shown that with intensive dialysis, the mortality rate was reduced to 36 percent. The need for and efficacy of dialytic treatment in a shipboard setting thus became evident.

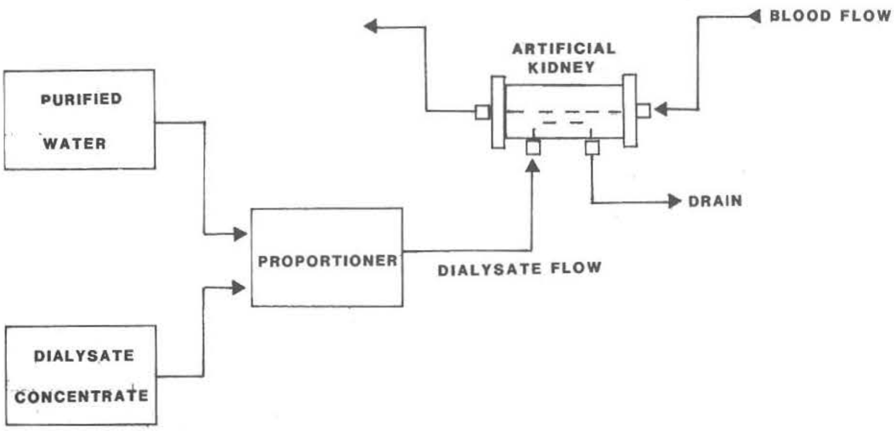


Diagram 1. Single-Pass System

In 1986, CAPT T.G. Patel, Adviser to the Surgeon General for Nephrology, Naval Hospital, Portsmouth, addressed the need for hemodialysis capabilities on board the newly commissioned hospital ship, USNS *Mercy*. He stressed that with an 80-bed intensive care unit and a total capacity of 1,000 hospital beds, *Mercy* required acute hemodialysis capabilities in order to provide maximal medical support.

It was readily apparent that the shipboard dialysis unit would be very different from those in the community setting. Generally, outpatient dialysis centers use stationary hemodialysis machines that use what is described as the single-pass system (Diagram 1). The large quantities of ultrapure water necessary for this type of system is derived from a water purification system that usually is an integral part of the dialysis facility.

A typical 4-hour dialysis treatment for a single patient consumes about 120 liters (32 gallons) of this ultrapure water. Clearly, the quantities of water necessary to treat multiple patients three to four times per week would not be available in a shipboard setting. Furthermore, since stationary hemodialysis machines are large and difficult to move, a central location amidst the complex of wards, laboratories, and operating rooms, yet near the intensive care unit, would have to be created. Lastly, a machine that would tolerate the motion of a ship and not require extensive training on the part of the operator would have to be selected.

All of the aforementioned problems were resolved with the selection of the sorbent dialysis system. As a fully integrated, portable unit, it incorporates all the accessories necessary for a completely independent dialysis treatment, requiring only 6 liters of potable water that need not be further purified (Diagram 2). It uses standard dialysis membranes while removing metabolic waste with a sorbent cartridge. With this "mobile" system, the need for a stationary hemodialysis unit was alleviated.

The "operational" need for technicians proficient in all the functions and aspects of hemodialysis on board *Mercy* and *Comfort* is fulfilled by the Transplantation Technician (NEC-HM 8433) rating. Training is provided at the Navy's four major teaching hospitals. In a 6-month program, a general duty corpsman can become thoroughly trained in the complexities of hemodialysis.

After it had been determined that acute hemodialysis could readily be performed aboard *Comfort* and *Mercy* using the sorbent system, in November 1988, a combined forces conference was held in Fort Detrick, MD. There, representatives of the Army, Air Force, and Navy were successful in standardizing all aspects of hemodialysis in the event of a mass mobilization. Again, the sorbent system met all the requirements and restrictions imposed by such a diverse group with unique potential combat theatres.

Hemodialysis is now operationally ready. Because of a concerted effort by the combined forces, casualties can now, in a forward area, receive acute dialytic support previously unavailable outside of tertiary care or specialty centers.

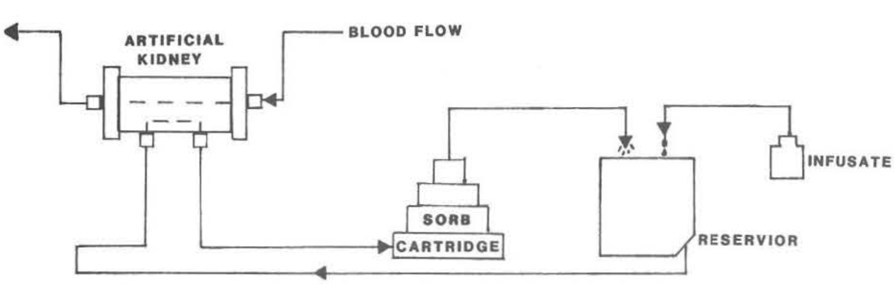


Diagram 2. Sorbent Dialysate Regenerating System

References

1. Balch HH, Meroney WH, Sako Y: Observations on surgical care of patients with post-traumatic renal insufficiency. *Surg Gynecol Obstet* 100:439-452, 1955.
2. Darmandy EM, Siddons AHM, Corson TC, et al: Traumatic uremia: Report of eight cases. *Lancet* 28:809-812, 1944.
3. Butkus DE: Post-traumatic acute renal failure in combat casualties: A historical review. *Milit Med* 149:117-124, 1984.
4. Howard JM (ed): Post-traumatic renal insufficiency, in *Battle Casualties in Korea*. Army Medical Service Graduate School, Walter Reed Army Medical Center, Washington, DC, 1956, vol IV.
5. Teschan PE, Post RS, Smith LH, et al: Post-traumatic renal insufficiency in military casualties. I: Clinical characteristics. *Am J Med* 18:172-186, 1955.
6. Smith LH Jr, Post RS, Teschan PE, et al: Post-traumatic renal insufficiency in military casualties. II: Management use of an artificial kidney, prognosis. *Am J Med* 18:187-198, 1955. □

Dr. Connito and HMC Balko are assigned to the Nephrology Division, Naval Hospital, Portsmouth, VA 23708-5000.

Metal Fume Fever

LT Charles Armstrong, MC, USNR
LCDR Timothy D. Almquist, MC, USNR

Metal fume fever is an acute self-limited syndrome consisting predominately of fever and respiratory symptoms that occur following exposure to freshly formed oxidized metal fumes. Originally described in 1822,(*1*) this condition has been reported in a variety of industrial settings and has been associated with several different metals. Many colorful and descriptive names have been used including brass chills, zinc chills, welder's ague, Monday morning fever, and foundry fever. The following illustrative cases were seen between March and October 1988 in the emergency department (ED) of Naval Hospital, San Diego.

Case 1: A 25-year-old MM2 presented to the ED complaining of a 2-hour history of a dry nonproductive cough, shortness of breath, fever, chills, headache, and muscle aches. He denied nausea, vomiting, neck stiffness, rash, or any odd taste. The patient worked as a welder and stated that he had welded galvanized material (iron or steel coated with zinc to retard oxidation) for the first time that day, and stated that he was not wearing a respirator as he usually did. Past medical history was noncontributory. Physical examination was significant for a well-developed anxious white male in mild distress. Vital signs were: temperature 102.2°, pulse 100 and regular, RR 18, and BP 126/80. HEENT examination was within normal limits. Lungs were clear to auscultation without wheezing or rales. Cardiovascular exam was normal. Chest X-ray was normal without infiltrates. Laboratory analysis revealed a leukocyte count of 12,200/mm3 with 14 percent band forms. A cutaneous pulse oximeter revealed greater than 97 percent oxygen saturation. The patient was treated with oxygen at 2 l/min via nasal cannula. He felt significantly improved after 2 hours of observation in the ED and was discharged to home with recommendations for bedrest and ibuprofen to be taken orally as needed for myalgia.

Case 2: A 31-year-old MM1 presented to the ED complaining of a 12-hour history of shortness of breath, a burning sensation in his chest, and a metallic taste. The patient had been welding galvanized material the previous day. The symptoms began approximately 4 hours after he had stopped welding. He denied cough, headache, muscle aches, nausea, or vomiting. Past medical history was significant for a remote history of asthma as a child, with no symptoms after age 5. Physical examination was significant for a well-developed white male who appeared in no distress. Vital signs were: temperature 99.3°, pulse 80, RR 20, and BP 146/80. HEENT exam showed mild bilateral conjunctival hyperemia. Lungs were clear to auscultation without wheezing. Heart sounds were normal. Chest X-ray was unremarkable. EKG revealed normal sinus rhythm without acute ST changes. ABG showed pH 7.39, pCO2 45, p02 103, CO 1.3. The leukocyte count was 8,900/mm3 and a differential count was not performed. The patient was treated with bedrest, an anti-inflammatory agent, and reassurance.

Clinical Presentation

Metal fume fever is a self-limited illness, with nonspecific symptoms, easily misdiagnosed as a viral process. The symptoms are fever (usually mildly elevated but may reach 104°), chills, dry cough, subjective dyspnea, chest tightness, and myalgia. Frequent associated symptoms are thirst, nausea, vomiting, and often a metallic or sweet taste. The physical exam may reveal wheezing or rales, although this does not appear to be a predominant feature in most described cases of metal fume fever.

The symptoms generally resolve after 24-48 hours after exposure, followed by complete recovery. In cases of chronic exposure a degree of tolerance builds up which is quickly lost after several days of nonexposure. Reappearance of symptoms may occur following reexposure, hence the name "Monday morning fever." There are no known chronic sequelae of this disorder, and no symptoms of pulmonary fibrosis or pneumoconiosis have been described.(*6*)

Acute cadmium pneumonitis is a disorder distinct from metal fume fever and one that is potentially fatal. However, both metal fume fever and cadmium pneumonitis may have similar presentations, and differentiation may depend solely upon an accurate exposure history.(*3*)

Pathogenesis

Acute inhalation of freshly formed oxides of specific metals, as produced by welding or torch cutting, is the precipitating event of metal fume fever. The symptoms characteristically do not occur immediately upon exposure, but rather after a latency period of 3-6 hours. Most cases develop with exposure to zinc oxide in a poorly

ventilated environment, most commonly after welding galvanized iron, but various other metals including cadmium, chromium, lead, copper, nickel, magnesium, manganese, antimony, and tin(*2*) have been implicated. Zinc oxide is formed when zinc or one of its alloys is heated within an oxidizing atmosphere to its boiling point of 907°C, resulting in particles ranging in size from 0.2 to 1 micron (μ). Particles of this size, if inhaled, may reach the periphery of the lung and affect alveolar function. Concentrations of zinc oxide as low as 5 mg/m3 have produced symptoms.(*2*)

The exact mechanism by which metal fume fever is caused is unknown, but theories abound. An immune complex reaction to the inhaled metal oxide fumes is the most widely accepted theory according to Mueller and Seger. McCord(*4*) suggested that the inhaled particles result in inflammation and damage of respiratory tract tissue, and the damaged tissue and metal oxide particles form an antigen which leads to production of an antigen-antibody complex. Anti-antibody may be formed against this immune complex and provides a degree of immunity to repeated exposure. This theory is attractive because it explains the short-term tolerance which develops in workers chronically exposed to zinc oxide fumes and the exacerbation of symptoms after periods of no exposure.

Other theories include a metal fume induced release of endogenous pyrogen,(*5*) and the production of a type of hypersensitivity pneumonitis. Vogelmeier et al.(*6*) performed bronchoscopy and bronchoalveolar lavage in a subject with a history of metal fume fever 1 day after challenge with zinc oxide fumes and found a tenfold increase in bronchoalveolar lavage leukocyte count with a marked increase in polymorphonuclear forms. Repeat bronchoscopy 7 weeks later showed a normal cell count. These authors state that metal fume fever resembles a hypersensitivity pneumonitis but is atypical, as a lymphocytosis is usually found in lavage specimens.

Investigative Studies

Metal fume fever is a diagnosis made by occupational history, as the laboratory features are not diagnostic. There is usually a mild leukocytosis (12,000-16,000/mm3) with a left shift. Lactic dehydrogenase may be moderately elevated with the third (pulmonary) fraction accounting for the elevation. Serum and urinary levels of specific heavy metals are usually elevated, but typically are not immediately available and have not been shown to correlate with degree of symptoms.(*7*)

The chest X-ray is usually normal, although transient infiltrates have been reported.(*8*) Mild hypoxemia may be apparent on arterial blood gas analysis. Pulmonary function tests may be acutely impaired (decreased PEFR, FEV, FVC), but return to normal values as symptoms recede. Malo et al.(*9*) precipitated symptoms of metal fume fever in two workers with a history of the illness by exposing them to zinc oxide fumes, and found significant reductions in FEVl (80 percent of predicted) and FEVl/FVC (60 percent of predicted) with gradual return to normal values over 24 hours.

Treatment

Treatment is supportive and consists of rest, analgesics, and antipyretics as well as education as to the preventable nature of this illness. Milk and antacids are a layman's treatment for exposure to metal fumes(*10*) and may provide symptomatic relief for occasional gastrointestinal irritation. Corticosteroids are occasionally recommended to reduce the inflammatory response in the rare more advanced cases, but no controlled trials have investigated this therapeutic option. Antibiotics likewise are of no proven benefit. Bronchodilation therapy should be used if wheezing or reduction of PEFR is present.

Several studies have documented elevated zinc(*6*) and copper levels, but chelation is not considered necessary and is not recommended. In general, the most appreciated treatment is reassurance that the symptoms are brief in nature and complete recovery can be expected.

Conclusion

Two cases of metal fume fever caused by the welding of galvanized metal have been described. These cases probably would have been attributed to a viral etiology if an occupational history had not been taken. In the event of exhaust ventilation or respirator malfunction, or poor work practices, a welder may receive significant exposure and experience symptoms. Our active duty population is subjected to a host of potential chemical exposures on a daily basis, and this syndrome is but one example of potential clinical sequelae to this exposure.

References

1. Mueller EJ, Seger DL: Metal fume fever: A review. *J Emerg Med* 2:271-274, 1985.
2. *Poisindex*, Micromedex Inc, 1986-1987, vol 51.
3. Barnholt S, Rosenstock L: Cadmium chemical pneumonitis. *Chest* 86:789-791, 1984.
4. McCord CP: Metal fume fever as an immunological disease. *Indus Med Surg* 29:101-107, 1960.
5. Pernis B, Vigliani EC, Cavagna G, Finulli M: Endogenous pyrogen in the pathogenesis of zinc fume fever. *Med Lav* 51:579-586, 1960.
6. Vogelmeier C, Konig G, Bencze K, Fruhmann G: Pulmonary involvement in zinc fume fever. *Chest* 92(5):946-948, 1987.
7. Noel NE, Ruthman JC: Elevated serum zinc levels in metal fume fever. *Am J Emerg Med* 6(6):609-610, 1988.
8. Dula DJ: Metal fume fever. *J Am Coll Emerg Phys* 7:448-450, 1978.
9. Malo JL, Cartier A: Occupational asthma due to fumes of galvanized metal. *Chest* 92(2):375-377, 1987.
10. Anseline P: Zinc fume fever. *Med J Aust* 2:316-318, 1972. □

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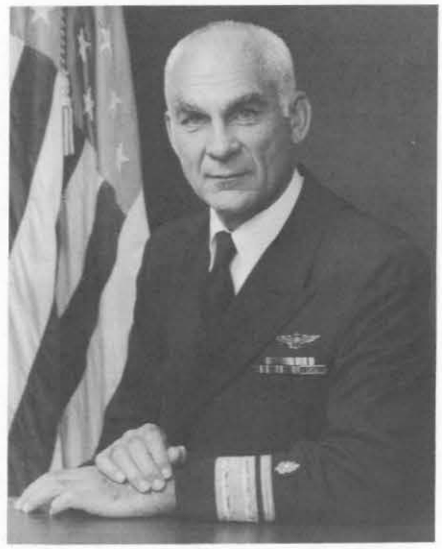

RADM Lucas

RADM **John R. Lukas**, MC(Ret.) died at Naval Hospital, Oakland on 22 Oct 1989. Born 24 Sept 1925 in Mercer, PA, Dr. Lukas' Navy career spanned 40 years.

He received his B.A. degree in chemistry in 1950 at Westminster College, New Wilmington, PA, Doctor of Medicine in 1954 from the University of Pittsburgh, and completed his internship and residency in obstetrics and gynecology in 1958 at Naval Hospital, Oakland.

RADM Lukas became a naval aviator in 1946, a flight surgeon in 1959, and held positions as medical officer or commanding officer at various military hospitals in California, Virginia, Texas, Florida, Guam, and Morocco. In 1978, he was selected as rear admiral and later assumed duties as Inspector General, Medical, Bureau of Medicine and Surgery, and Special Assistant to the Surgeon General for Medical Readiness. He retired from the Navy in 1984 and resided at his home in Pebble Beach, CA, until his death.

HMCM **Stephen W. Brown** (Ret.) died of cancer 26 Oct 1989 at the National Naval Medical Center. Brown served as the Force Master Chief Petty Officer of the Medical Department from February 1981 to 1985.

During his 34 years in the Navy, Brown served in a variety of assignments, including the 1st Marine Division in Korea; USS *Philippine Sea* (CVA-47); Naval Hospital, San Diego, CA; Naval Hospital, Oakland, CA; 3rd Medical Battalion, Okinawa; and Command Master Chief, Oakland. Perhaps his most notable duty, however, was as the first enlisted Director of the Hospital Corps at the Bureau of Medicine and Surgery.

Brown was named Director of the Hospital Corps, a position normally held by a Navy captain, 17 June 1979. In making the announcement, VADM W.P. Arentzen, Navy Surgeon General, said, "Master Chief Brown, with 27 years' service and a master's degree in public administration, is a fine example of the type of senior enlisted personnel we have in the Navy today. Highly educated, with years of practical experience and great leadership qualities, he is an ideal man for the job." Brown directed the 24,000 men and women of the Hospital Corps for the next 2 years before his selection as Force Master Chief Petty Officer of the Medical Department.

As Force Master Chief, Brown served as the senior enlisted advisor to Navy Surgeon General VADM J. William Cox. He traveled throughout the Navy, meeting with enlisted hospital corpsmen, listening to their comments and advising the Surgeon General on enlisted medical matters.

Brown held lifetime college-level teaching credentials from California and was a registered sanitarian in Oregon. He earned his bachelor's and master's degrees in public administration from Golden State University. He was a graduate of Hospital Corps General Surgery and Operating Room School and the Preventive Medicine Technician School.

Earlier this year, the Navy established the "HMCM Stephen W. Brown Preventive Medicine Technician of the Year Award" to recognize individual PMTs for their "sustained professional excellence and significant contributions to the Navy's Occupational Health and Preventive Medicine Program."

Brown retired from the Navy in 1986. He was buried with full military honors 30 Oct 1989 at the National Cemetery, Quantico, VA.

—Sonny Auld, Public Affairs Office, NNMC Bethesda, MD.

HMCM Brown

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